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LOG DIAGRAMING GUIDE for western softwoods

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PREFACE

Following recommendations of the U.S. Forest Service 1957 Timber Quality Conference and the Log Grade Committee, a national program was established in 1958 to develop and carry out a coordinated plan of research in the field of log and tree grading. This program, designed to produce practical timber-quality specifications applicable over wide areas, will use data from studies made at a number of places by many Forest Service units and possibly by other agencies. To assure uniformity in data, a degree of standardization in study techniques is essential. Generally, such standardization takes the form of minimum requirements related to measurements, definitions, procedures, and overall study plans.

The Douglas-fir Log Grade Project, at the Pacific Northwest Station, and the Western Pine Log Grade Project, at The Pacific Southwest Station, include preparation of overall work plans for the development of log and tree grades for western softwoods. As a part of these work plans, this guide covers the details of diagraming western softwood tree segments.

Since the procedures outlined in this guide are minimal, they do not preclude collecting additional or more detailed information. Although the procedures have been well tested in the field, better ones may be found. If so, supplements or revisions will be issued. In the meantime, this guide will be used for standardizing procedures, diagrams, and records.

LOG DIAGRAMING GUIDE FOR WESTERN SOFTWOODS

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INTRODUCTION

The purpose of this publication is to establish standard minimum procedures for diagraming western softwood logs. Such standards are necessary for two reasons:

1. To help insure that data are collected properly and uniformly on each individual study and

2. To insure that data from different studies can be combined (by species) for broad quality studies covering the commercial range of a species.

The text is concerned mainly with diagraming logs in mill yards or other concentration points and cull or broken log sections left in the woods. However, the discussions and procedures herein apply generally to special products such as poles and veneer blocks as well.

This publication is not a substitute for training and experience in diagraming. Rather, it is a guide for the trained man and a tool for training the inexperienced.

Diagraming in General

Logs are diagramed to make an accurate and complete record of all visible surface and end characteristics. In effect, a diagram is a means of storing a detailed record of the appearance of a log without storing the log. It provides a wealth of information that can be used and reused in many ways after a log is sawn.

One major use of log diagrams is for developing, testing, and comparing different systems of grading logs or trees. There is a relationship between the surface characteristics of a log and the amounts, sizes, and grades of lumber that can be produced from it. Diagrams make it possible to study this relationship systematically.

Another major use is for developing tables to predict lumber recovery. Diagrams insure that the time, money, and effort invested in product-recovery studies for the development of yield data are not lost if log grade specifications change after the studies are completed. The logs can be regraded from the diagrams using any new set of grading specifications. The product-recovery data can then be regrouped into new performance tables for the new log grades.

Diagraming logs is expensive and tedious work. To realize the greatest possible return from this expense and labor, log diagrams must be made with care and accuracy. Each diagramer must be familiar with the basic principles of diagraming. For greatest efficiency, a diagramer should also know the factors affecting quality and the techniques used to convert logs to lumber.

Basic Principles of Diagraming

1. All log surface and end characteristics should be recorded. Whether or not a particular characteristic is currently considered as a grading defect is immaterial.

2. Surface characteristics should be classified and recorded only on the basis of what is visible on the bark surface. If there is evidence of a surface characteristic on an end section, record it. But do not let this evidence influence the classification of the surface characteristic. When a man is being trained, it may sometimes be necessary to chop into a log to learn the cause of a particular blemish. When actually diagraming, however, do not chop into a log in order to decide what to call a particular surface characteristic.

3. Accuracy is all important. The value of any diagram depends entirely on the accuracy and legibility with which the diagramer interprets, measures, and records what he sees. Future users of completed diagrams cannot look at the actual logs. This fact underscores the need for accuracy in diagraming. It also makes it of vital importance to note any special or unusual features of a log. Those who use the diagram later will then have access to all the information that was available to the diagramer.

THE DIAGRAM FORM

General

The diagram form discussed and illustrated herein (appendix) should be considered as the minimum acceptable for use. It is NOT intended for mandatory "as-is" use on all studies involving western softwoods. For a given study, special features may be added, if desired, to cover items of particular local interest. For example, additional detail regarding the surface indications of red rot might be of particular interest in a study located in the Black Hills where red rot is critical. Spaces for recording additional measurements or determinations of this factor could therefore be added to the basic diagram form.

Diagram forms should be printed on a good grade of paper, so as to stand up well under field conditions and to survive repeated handling during analysis of data.

Explanation of Captions and Entries

The following explanations and instructions apply to entries to be made on the diagram form (see appendix). Note that some items are marked with an asterisk to indicate which entries are to be made later in the office. All other entries should be made in the field at the time of diagraming.

1. Mill: Record the assigned code number.

2. Species: Use the assigned Forest Survey 2-digit code.

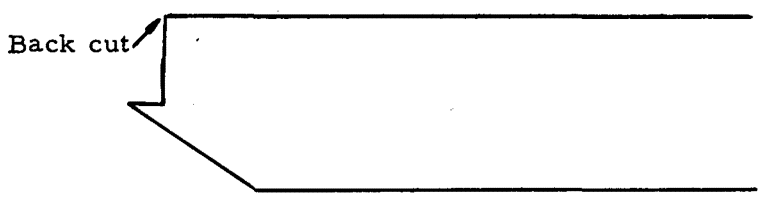
3. Project number: Use if one has been designated; otherwise leave blank.

4. Area number: This is the number assigned a sample area from which logs are selected. Record the appropriate number from the log-end tag.

5. Tree number: Consecutive tree numbers are assigned, beginning with "1" on the first area sampled. Record the appropriate number from the log-end tag.

6. Log number: The log number refers to the position of each log in the tree beginning with "1" as the butt log. Record the appropriate number from the log-end tag.

7. Length: Record the total length of the log in feet and inches, to the nearest inch (16^{6} means 16 feet, 6 inches). Measure with tape or log measuring stick. For logs with slanting end cut(s), record shortest length. For butt logs, measure from the back cut--not the undercut (see sketch below).



8. *Scaling diameter: Make entry in office; use data in scale book.

9. *Gross scale: Make entry in office; use data in scale book.

10. *Net scale: Make entry in office; use data in scale book.

11. *Scale deductions: In office, enter the cause(s) and volume(s) of scale deduction. For logs that have no scale deduction, place "00" in the spaces. (Take information from scale book.)

12. *Mill tally: In office, enter the volume of surfaced dry product recovered from the log.

13. *Total value: Space is provided here for later office entry if data needed in detailed study of the diagrams.

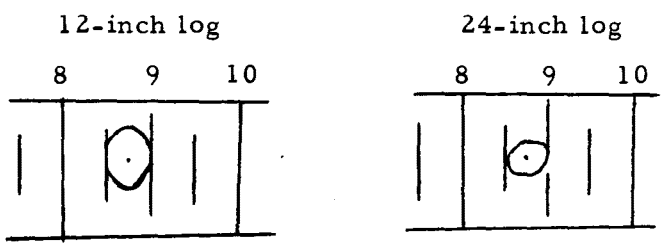
14. *Log $/M: Space is provided here for later office entries if data needed in detailed study of the diagrams.

15. *Log grade: In office, record the grade(s) of the log as determined from specifications of the grading system(s) applied to the log. Identify the grading system used for determining each grade.

16. Log faces: The four graduated outlines on the diagram form represent four faces of the log. Each face is one-fourth the circumference in width for the full length of the log. These outlines are numbered at each end "1," "2," "3," and "4." The 1-foot and 6-inch graduations serve as guides in drawing the surface characteristics to scale.

Record the location of all visible surface characteristics on these faces to the nearest inch of length (lengthwise of the log) and the nearest one-eighth of face width (across the log). For small, circular characteristics like log knots, the center is the key spot. Pinpoint this with a dot. Then draw to scale the general outline of its shape around the indicated center and record the size alongside. For larger, often irregularly shaped characteristics like scars and large burls, the precise location of the outer edges is essential. Sketch these edges exactly and record the appropriate symbol and size alongside.

Keep in mind that the lengthwise scale on the diagram is fixed but that the crosswise scale (across the log face) varies directly with log diameter. For example, a 6-inch log knot covers twice as much of a face on a 12-inch log as it does on a 24-inch log. Therefore, sketch the width of a characteristic to show the true proportion of the log face which it affects (see sketch).



Note: Lengthwise scale is the same; crosswise scale varies. Sketch the width of a characteristic to show the true proportion of the log face which it covers.

17. Log-end circles: These quartered circles at the bottom of the form represent the log ends. The left circle represents the large or butt end; the right circle, the small or top end. The numbers adjoining each quarter circle refer to the log face location.

Use these circles to sketch in log end characteristics. Measure and record both the long axis (longest) and short axis (shortest) diameters of each log end to the nearest one-tenth inch. When these measurements differ by more than 1 inch, sketch in the out-of-round features.

If a log end is clear, write a large "C" in the circle.

18. Diagramer(s): Record the initials of the person(s) doing the diagraming. Show the recorder's initials first.

19. Date: Date of diagraming.

20. Bark thickness: Record the bark thickness at the small log end to the nearest one-tenth inch (average of two measurements).

21. Sap thickness: Record the sap thickness at the small log end to the nearest one-tenth inch (average of two measurements).

22. Crook and sweep: Record the indicated measurements on the schematic drawings between the two log-end circles.

    For logs with multiple crook or sweep, make additional sketches as needed under the "Comments" section. Also under this section, sketch and describe logs with unusual single crook or sweep. ("Unusual" means of such shape or type that the schematic drawings do not allow adequate description.)

    Instructions on how to measure crook and sweep are found on pages 12 and 17.

23. Comments: Record in this space any significant information about the log not recorded elsewhere on the form. Remember that future users of the finished diagram will never see the actual log. Some examples of pertinent information are:

    a. Faces 1 and 2 covered with mud,

    b. Butt half of log covered with bird peck, and

    c. Unusual bark formation (describe).

24. Ring count (butt logs): Count and record the number of annual rings on the large end of each butt log. If rot or other condition makes an exact count impossible, obtain the best estimate possible and identify it as such. On a mill study, it works best to assign this job to one man as an extra task.

25. Rings, last inch (butt logs): Count and record the number of annual rings in the last inch of radius at the large end of each butt log. Avoid areas of eccentric growth. On mill studies, the ring counter also does this job.

26. Spiral grain: Measure and record any surface evidence of spiral grain. Place the measuring stick on the log (parallel to its length) at a point where the stick edge bisects some evidence of spiral grain. Examples of possible "evidence" are twist showing in the grain of

exposed wood, a spiral effect in the bark pattern, and spiral flutes. Record the type of evidence. Then measure how much the spiral grain evidence twists away from the straight measuring stick over a 1-foot distance. Also record the point on the log where this evidence occurs. Example: Wood grain, 2-1/2 inches per foot at 6 feet.

27. Characteristics and symbols: The back of the diagram form contains a list of characteristics commonly found on log surfaces and ends, and the symbols to use in recording them. A key to the dimensional measurements required for each characteristic is also shown.

Definitions of these characteristics and detailed instructions for their measurement are found in the following section.

LOG CHARACTERISTICS AND THEIR MEASUREMENT

Diagram characteristics of the bark surface on the appropriate face(s) of the diagram form. Diagram characteristics of the end section on the appropriate log-end circle(s). Some characteristics are visible on both the bark surface and the log end(s); diagram these in both places. In the latter case, make sure that the surface and end sketches agree as to location, size, and shape of such characteristics.

Surface Characteristics

In the following definitions and instructions, "length" means the dimension parallel to the long dimension of the log; "width" is measured across the log face, at right angles to the log length; "height" refers to the elevation above the regular log surface; and "depth" means depression below the normal log surface. Always show these measurements in this sequence: length by width by height (or depth).

Bark distortion (D): Definite break or alteration in the normal pattern of the bark which cannot be clearly related to any of the recognized characteristics. Measure diameter, or length and width, to the nearest inch; example: ⊙ D 1 x 2.

Bird peck (BPK): Holes made by sapsuckers or woodpeckers in or through the bark into the cambium layer. Holes are either open, partially closed, or completely filled with callus tissue. Measure length and width (to the nearest inch) of the area affected when there are four or more holes per square foot; also record the average number of holes per square foot (sample Form No. 1, face 3). Diagram scattered individual holes with the correct symbol, but without measurements (sample Form No. 1, face 4). Describe bird peck with appropriate symbols:

BPK-O: Open bird peck--open holes, no callus tissue, indicating peck is fresh or did not injure the cambium.

BPK-C: Closed bird peck--holes are partially or completely closed by callus tissue.

Bulge (Bulge): A general enlargement entirely around the circumference of a portion of a log, barrellike in appearance and often indicating the presence of internal rot. Measure the length (to the nearest inch) between the points where it departs from and returns to the normal log taper. Measure the maximum height (to the nearest inch) to which it protrudes above the normal log surface (see sample Form No. 4).

Bump (B): A small bark-covered swelling on a log surface. Sometimes the bark is slightly open or fissured and exuding a little superficial pitch. Some bumps bear a passing resemblance to log knot overgrowths or small cankers, but in most cases they can be readily differentiated. Measure length and width to the nearest inch and height to the nearest half inch.

Burl:

Burl, sound (BL): A hard, woody protuberance on a log surface, with no evidence of pitch flow. It is round or elliptical in shape, and has no protruding limbs or remnants of former limbs. Bark covers it, but usually not in a normal pattern. Often the fissures are slanted or at right angles to the normal position. Measure length and width at the point of attachment to the log and height above the regular bark surface, all to the nearest inch. Sketch size and shape at the point of attachment (see sample Form No. 1, face 3).

Burl, unsound (UBL): Has the same general shape as a sound burl, but is partially dead or shows evidence of heavy, surface pitch flow. Measure and record as for sound burls.

Butt swell (Swell): An enlargement of the butt end of a tree, greater than the normal butt taper. Measure its length (to the nearest inch) from the log end to the point where it meets the normal taper. Measure height from the point of normal taper to the actual log surface at the log end (to the nearest inch--see sample Form No. 1, faces 1 and 4).

Canker (Cank): A partially open lesion, characterized by destruction or distortion of tissue, callus formation, and by pitch flow in varying amounts. Most common causes are stem infections of dwarfmistletoe and various rusts. Sketch location and shape of outer edges and record maximum length, width, and depth to the nearest inch. Record type or cause of canker if possible (see sample Form No. 2, face 2).

Conk (C): The fruiting body of a fungus, denoting the presence of interior rot. Usually, the conk itself is missing by the time the log is presented for diagraming. However, its point of attachment is marked by a hole

or swelling filled with a brown, punky substance. Sketch the conk location on the diagram, and measure its size (length and width, or diameter) to the nearest half inch at the point of attachment.

Conks, or the brown punky substance, are frequently found around log knots. In these cases, diagram the log knots and sketch solid the portions affected by the conk (see sample Form No. 2, face 3).

Crook (CR): An abrupt bend in a log. Determine the point of departure of the crooked section from the main axis of the log; record its distance from the nearest log end (feet and nearest inch) on the appropriate end of the schematic drawing on the diagram form. Measure (to the nearest inch) and record the maximum departure of the crooked section in the space provided (see sample Form No. 1).

Flange (FLG): A protruding buttresslike structure at the base of a tree, extending outward beyond normal butt or stump flare. Diagram location and shape; measure length, width, and height to the nearest inch. Also sketch the flange on the log-end circle. Make sure the log-end and log-surface sketches agree as to location, size, and shape of the flange (see sample Form No. 1, face 2 and large-end circle).

Flute (FLT): A narrow troughlike depression appearing lengthwise on a tree and generally confined to the butt log. Diagram location and shape; measure the length, width, and depth to the nearest inch. Also sketch the flute on the log-end circle. Make sure the log-end and log-surface sketches agree as to location, size, and shape of the flute (see sample Form No. 1, face 4 and large-end circle).

Log knots: Log surface characteristics which indicate knots in the underlying wood. These include limbs, limb stubs, overgrowths, and any other indications of where a limb grew. Locate the center of these characteristics precisely on the diagram form with a dot. Sketch their shape to scale around the indicated center, using the appropriate symbol. Record average diameter alongside, using the following size classification:

1/2	.... 1/2 inch or less
3/4	.... over 1/2 inch but not over 3/4 inch
1	.... over 3/4 inch but not over 1 inch
1-1/2	.... over 1 inch but not over 1-1/2 inches
2	.... over 1-1/2 inches but not over 2 inches
2-1/2	.... over 2 inches but not over 2-1/2 inches
3	.... over 2-1/2 inches but not over 3 inches
4	.... over 3 inches but not over 4 inches
	etc.

When a log knot occurs on the boundary between two diagraming faces, sketch the proportionate part of it in each face. Leave the circle open at each face boundary, indicating that the log knot continues into the next face (see sample Form No. 1, faces 3 and 4).

Specific measuring instructions (where needed) and the details of log knot classification and recording are as follows:

Live log knot (⊙): Intergrown with the surrounding wood at the log surface, with no indication of decay. Bark is usually present on the limbs which result in this type of log knot. Measure average diameter inside the bark at the log surface. Do not include any of the swelling sometimes present at the limb collar. Mark the limb center, and sketch limb size to scale on the diagram, recording diameter alongside. Whenever this limb size (including sapwood) is more than 1 inch larger than the heartwood alone, diagram as two concentric circles. Record two diameters, one overall and one the size of the heartwood only. For example: ◎ 6/3 means a live log knot, 6 inches overall with 3 inches of heartwood.

Dead log knot (●): Not intergrown with the surrounding wood at the log surface, with no indication of decay. Sometimes called encased. Bark is usually absent from the limbs which result in this type of log knot. Measure the average diameter of the dead material only. Ignore any surrounding callus tissue. Record as for a live limb, except fill in the circle with pencil. Since the filling-in process obscures the dot marking the log knot center, it is especially important to sketch the log knot precisely around its center point.

Rotten log knot (⊙ R or ● R): Results from live or dead limbs showing rot. Show type of log knot by the appropriate symbol; then record the size, followed by an "R" to indicate that the log knot is rotten. For example: ⊙ 3R means a 3-inch, live log knot with rot; ● 2R means a 2-inch, dead log knot with rot.

Overgrowth (X): The scar left in the bark by a limb completely overgrown but still clearly outlined by the circular configuration in the bark. Usually there is a small hole or depression in the center of the configuration. Measure diameter to the outer edge of the overgrowth pattern, ignoring any extremes in bark pattern. In butt logs from young trees, the overgrowth pattern is frequently two elongated half circles occurring on the sides of a fissure. In this case, the diameter of the half circle is the overgrowth size. Draw the center of the "X" over the center of the overgrowth, and record the size alongside.

Cluster (KCl): Two or more limbs growing in a more or less inseparable group. If only two log knots are in a cluster, diagram both as single log knots. If more than two, sketch the outline of

the cluster to scale on the diagram form, and show the symbol "KCl." Within the outlines, locate the center and show the character and size of at least four of the most prominent log knots. (This is a minimum. Specific studies may require more detail.) Measure length and width of the cluster to the nearest inch; measure height (if applicable) to the nearest half inch (see sample Form No. 1, faces 2 and 3).

Sucker limb (Sucker): Any limb growing at an acute angle from the stem. Usually these are larger than and widely separated from the other limbs on the log. They appear as a branch stub with one side partly buried in the log surface. Diagram the shape, and measure the length of the portion in contact with the log. Record both length and width to the nearest inch.

Epicormic branch (EB): Small sprout-type limbs, one-half inch or less in diameter, that originate from dormant or adventitious buds. Epicormic branches sometimes occur singly, and sometimes in clusters. If singly, record with a dot and "EB," but without size measurement. If in a cluster, diagram two or three small dots, and show "EB" alongside, again with no measurement.

Where any limb over one-half inch in diameter occurs with epicormic branches, diagram as a knot cluster (KCl).

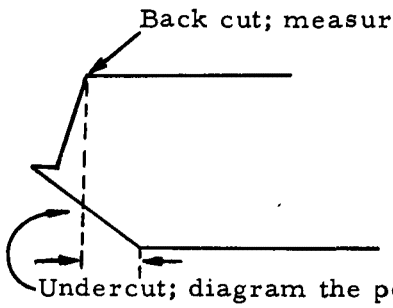
Mechanical damage (MD): Breaks, splits, cracks, tong marks, brooming, holes, or any other damage created during any phase of the harvesting operation. Measure maximum length, width, and depth of the damage to the nearest inch. (Disregard if maximum depth of the damage is 1 inch or less.) Sketch to scale on the surface characteristics portion of the form. Show also on the end circle if the log end is affected (see sample Form No. 3, faces 2 and 3 and small-end circle).

Sap rot (SR): Decay in the sapwood zone of a log. Sketch the shape of the affected area, and record length and width to the nearest inch. Record depth, where possible to measure, to the nearest inch. (Depth is usually equal to sapwood thickness.)

Scars and seams (SC): Injuries or wounds of a tree, other than those listed under mechanical damage. Accurately sketch location and shape of the affected area on all appropriate faces and end circles on the diagram form. Record maximum length, width, and depth, all to the nearest inch. Indicate condition as open (SC-O), partially open (SC-P), or closed (SC-C). Record cause, if it can be determined, as fire (Fire), frost (Frost), lightning (Light), rubbing or felling (R-F), or other (by cause or unknown). Example: SC-O (Light) 16' x 3 x 2 means an open lightning scar, 16 feet long, 3 inches wide, and penetrating 2 inches into the log (see sample Form No. 3, faces 1 and 2, and sample Form No. 4, face 3, small-end circle).

Sweep (SW): A gradual bend in a log. Determine the point of maximum deviation, and measure its amount (distance between chord and arc) to the nearest inch. Measure the distance of this point from the large log end, and record to nearest inch. Record these measurements on the schematic drawing of sweep on the diagram form. Ignore any sweep with maximum deviation less than 2 inches (see sample Form No. 4).

Undercut (UC): The slice of wood removed from a tree prior to felling in order to help control the direction of fall. Record maximum length (up the log), width (across the log), and depth (into the log) to the nearest inch, and sketch the shape of the undercut on the appropriate diagram face(s) (see sample Form No. 2, faces 1 and 2 and large-end circle).


Back cut; measure from here in diagraming.
Undercut; diagram the portion between the dotted lines on the appropriate face(s) of the form.

Weather checks (WC): Narrow cracks in the log, usually caused by the sun when bark is removed and the wood is exposed. Diagram only if 1 inch or deeper at a point at least 1 foot from either log end. Measure length to the nearest inch (see sample Form No. 1, face 2 and small-end circle).

Log End Characteristics

In the following definitions and measurement instructions, "length" means the long way and "width" the short way of the particular characteristic. "Depth" means distance into the log and is used only for stump shot and undercuts.

Bark pocket (BP): A pocket or patch of bark surrounded by wood. Measure length to the nearest inch and width to the nearest half inch. Sketch to scale on the log-end circle.

Blue stain (BS): A blue discoloration of the wood, generally found only in wood that is recently scarred or dead. Sketch the area affected, and show dimensions to the nearest inch.

Checks:

Natural check (CH): Separation of the wood fibers in a radial direction from the heart outward; no pitch in the separation.

Caused by stresses within the log or external forces acting on the tree (e.g., wind). Look carefully for any short checks branching out from the main one. If check is straight, and no "branch-outs" show, resulting in a "blocked-out" width of a half inch or less, record only the length dimension to the nearest inch (sample Form No. 2, large-end circle). If check is crooked or if "branch-outs" exist, resulting in a "blocked-out" width of more than one-half inch, sketch the actual shape on the log-end circle, and record the length and width dimensions of the "blocked-out" area to the nearest inch (see pitch seam on sample Form No. 3, large-end circle).

Weather check (WC): Separation of the wood fibers in a radial direction from the log perimeter towards the center, caused by drying of the exposed wood. Diagram only if they penetrate 1 inch or deeper below the log surface. Measure length to the nearest inch (see sample Form No. 1, face 2 and small-end circle).

Compression wood (CW): Abnormal wood, usually occurring on the lower side of branches and inclined trunks of coniferous trees; marked by a greater than normal proportion of summerwood to springwood. Sketch the area affected, and record its dimensions to the nearest inch (see sample Form No. 4, small-end circle).

Crotch (Y): A point in a tree where the trunk divides into two leaders or stems. When the bucking point at the top end of a log is through a crotch, several special characteristics are evident on the log end and are to be diagramed.

The log cross section will be out-of-round, sometimes resembling a figure eight. Sketch the actual shape on the small-end circle. Two pith centers will be evident. Show their location, and measure (1) the distance between these centers and (2) the distance from the log perimeter (inside bark) to each center, both to the nearest inch. Bark or a seam is often present. When it is present, diagram as a bark pocket, following instructions listed earlier (see sample Form No. 2, small-end circle).

Log knot: A section of a branch or limb visible in a log end. Shape varies according to the angle the limb makes with the plane of the bucking cut. Sketch to scale. Use surface characteristics code and instructions to indicate type and size of knot. If knot is partially dead, pencil in the dead portion on the sketch and record its length (see sample Form No. 1, face 4 and small-end circle).

Mechanical damage (MD): Breaks, splits, cracks, brooming, holes, or any other damage created during the harvesting operation. Measure length, width, and depth of damage to the nearest inch and sketch to

scale. If damage shows on the log surface, be sure the end-circle sketch agrees with the log-face sketch (see sample Form No. 3, faces 2 and 3 and the small-end circle).

Pitch, massed (MP): A clearly defined accumulation of solid resin in a body by itself. (Ignore fresh pitch.) Measure length and width of the affected area to the nearest inch.

Pitch pocket (PP): A pitch-filled separation of the wood fibers along an annual ring, 4 inches or less in length. (Ignore fresh pitch.) When the distance between two or more pockets is less than 2 inches and their combined length exceeds 4 inches, diagram as a pitch ring. If three or more appear in a 6-inch-square area, measure and record length and width of affected area to nearest inch. Otherwise, measure length of individual pocket(s) to nearest half inch and show width of opening to nearest eighth inch if it exceeds one-eighth inch (see sample Form No. 3, small-end circle).

Pitch ring (PR): A pitch-filled separation of the wood fibers along an annual ring, more than 4 inches in length. (Ignore fresh pitch.) If the ring is full (a complete circle), measure and record the diameter of the circle to the nearest inch. If the ring affects only a portion of the circle, measure the chord of the arc described to the nearest inch. Measure width (opening) of all pitch rings to the nearest eighth inch if it exceeds one-eighth inch. Sketch location and shape. Always measure (to the nearest inch) and record the radial distance from the log perimeter (inside bark) to the ring or arc. On partial rings, also measure and record the radial distance from the arc to the chord (see sample Form No. 3, large- and small-end circles).

Pitch seam (PS): This differs from a natural check only in that the separation contains pitch. Measure and record the same as a natural check. These occur more often in the large end of butt logs (see sample Form No. 3, large-end circle).

Pith off center (POC): Pith 2 inches or more from the geometric center of a log due to eccentric growth. This is one evidence of possible compression wood. Sketch actual location of the pith center and record distance from geometric center to nearest inch (see sample Form No. 4, small-end circle).

Rot: Decay due to wood-destroying fungi. The importance of various types of rots varies widely by species and location. Because of this, the rots listed below are discussed only in general terms.

Sketch all rots to scale on the log-end circles, and shade in the affected area. Measure and record the maximum length and width to the nearest inch. If possible, also record the causal fungus and the

stage (i.e., incipient, advanced, broken down, etc.) to which the infection has progressed.

Prepare special instructions for each study where logs will be diagramed, giving any required detail on what rots to look for and how to measure and record them.

Butt rot (BR): Decay in the butt log, usually confined to the stump end, but sometimes also showing at the small end. Common types and the causal fungus are:

1. Brown cubical rot (Polyporus schweinitzii)

2. White spongy rot (Fomes annosus)

Trunk rot (TR): Decay in the heartwood zone of a log. Common types and the causal fungus are:

1. Red ring rot (Fomes pini)

2. Red ray rot (Polyporus anceps Pk.)

3. Indian paint fungus (Echinodontium tinctorium)

Sap rot (SR): Decay in the sapwood zone of a tree. The wood is discolored and broken down, usually around the entire log circumference. Measure and record the thickness of the affected ring to the nearest half inch.

Scars and seams (SC): Injuries or wounds of a tree, other than those listed under mechanical damage. Record condition, cause (if possible), and size, following instructions listed under "Surface Characteristics." Sketch shape to scale on the appropriate log-end circle(s) (see sample Form No. 1, face 3 and large-end circle).

Shake (SH): A separation of the wood fibers along an annual ring. This differs from a pitch ring only because it is free of pitch. Use the directions for sketching, measuring, and recording as listed for pitch ring.

Spangle (SP): Three or more crisscrossed pitch seams, forming a star or spiderlike shape. Occurs mostly in the stump end of butt logs. Sketch the area affected; measure and record average dimensions to the nearest inch (see sample Form No. 4).

Stump shot (SS): Voids in the log end resulting from wood fibers that pulled out during the felling operation. Measure and record length and width of the affected area and maximum depth of penetration, all to the nearest inch. Use tape, wire, or other probe to determine the maximum depth of penetration.

Undercut (UC): Described under "Surface Characteristics." Sketch shape on large-end circle and record dimensions as described under "Surface Characteristics" (see sample Form No. 2, faces 1 and 2 and large-end circle).

Worm holes (WH): Holes made by wood-boring insects. Classify hole size as follows: pin (WH-P), if not over a sixteenth inch in diameter; small (WH-S), if over one-sixteenth but not over one-quarter inch in diameter; and large (WH-L), if over one-fourth inch in diameter. Measure and record length and width of the affected area to the nearest inch and sketch its shape and location. When worm holes occur in scars, diagram them as part of that characteristic (see sample Form No. 1, large-end circle).

DIAGRAMING PROCEDURES

Most diagraming of western softwood logs is done in connection with mill studies. The purpose of such studies is usually to gather data for performance tables or log grade development. Large numbers of logs are needed, and time available for diagraming is usually limited. The number of experienced log diagramers is also usually limited. This means that a large crew of inexperienced men must be trained in diagraming for each study. And further, they must quickly become skilled, accurate, and efficient in order to meet the quality and time requirements of the particular study. The following procedural outline for diagraming will help insure efficient, accurate, and complete data recording.

I. Crew organization.

   A. Crew leader. Trains, supervises, and checks accuracy of work.

   B. Assistant crew leader. Helps crew leader. Needed only if crew size exceeds six diagramers.

   C. Ring counter. Makes all ring counts and conveys information to diagraming teams.

   D. Diagraming team.

      1. Caller.

      2. Recorder. Should be the team's more experienced man at beginning of job. Can switch later, if so desired.

II. Equipment (for each diagraming team).

   A. Diagraming instructions.

   B. Standard diagram forms.

   C. Clipboard.

D. Rubber bands, 1/8 inch wide.

E. Pencils, medium soft, 2H or 3.

F. Keel, soft. Of color most visible on species to be diagramed.

G. Keel holder, with wrist strap. One holder per crew.

H. Steel rule, 6-foot. One for each man.

I. Hatchet for squaring up knots and removing dirt.

J. Measuring stick, 1 inch by 2 inches by 16 feet, surfaced and knot free, with:

1. 1-foot marks (lines across 2-inch face) marked and numbered on one side with dark-colored keel.

2. 1/2-foot points marked by short lines.

3. stick turned over, ends reversed, and 1 and 2 repeated.

K. Two peaveys or cant hooks.

III. Procedures for recording log characteristics on diagram form.

A. End characteristics.

1. Duties of caller.

a. Rolls log to starting position (painted orientation line up, if applicable).

b. Places measuring stick lengthwise on log.

(1) On top of orientation line.

(2) "Zero" at large end of log, flush with the appropriate measuring point (back cut on butt logs; short side on other logs).

c. With keel, divides big end of log into equal quarters.

(1) Draws vertical line from top of log (under stick end) to to bottom. Makes arrow point at top for later reference.

(2) Draws horizontal line at right angles to first line, making a cross.

(3) Numbers each quarter, starting in the upper-left section with "1" and proceeding clockwise. When marking and numbering, avoids obliterating the identifying tree and log numbers on the log end. (Note: The end of the log now resembles the large-end circle on the form. Each quarter section as numbered corresponds to one of the four log-surface faces.)

d. Measures long axis (longest diameter) and short axis (shortest diameter) of large end of log to nearest one-tenth inch and calls measurements to recorder.

e. Next, with keel, extends the lines at 9 and 3 o'clock along the sides of the log, full length, to delineate face boundaries. A carpenter's chalkline can also be used for this purpose. (Note: The line on the left side is the boundary between faces 1 and 4; the measuring stick divides faces 1 and 2; the right-side line is the boundary between faces 2 and 3.)

f. At small end of log, determines log length in feet and inches, and calls figures to recorder.

g. Marks off small end of log into quarters, as done previously on large end. (Note that small end numbering is a mirror-image of large end numbering. Face 1 is in the upper right-hand corner, and numbers proceed counterclockwise. The end of the log now resembles the small-end circle on the form.)

h. Measures long axis and short axis of small end of log (to nearest one-tenth inch) and calls measurements to recorder.

i. Measures bark thickness and sapwood thickness (to nearest one-tenth inch) and calls measurements to recorder.

j. Checks for and measures

(1) Spiral grain,

(2) Crook and sweep, and

(3) Other special characteristics which are important in a particular study, and

(4) Calls information to recorder.

k. If recorder is not yet ready to diagram the surface characteristics, assists him to complete his tasks by measuring the size of log end characteristics, etc.

2. Duties of recorder.

   a. Places 20 or 30 diagram forms in clipboard, left end under clip.

   b. Uses a rubber band to hold the forms flat.

   c. Fills in headings for log identification as required. Writes legibly, making figures dark for easy reading and for permanency.

   d. Diagrams the log ends.

      (1) Faces the large end of the log. Holds the clipboard with the clip end against the chest. (Note that faces 1 and 2 on the large-end diagram are on top of the circle. This is the log end position at start of diagraming. Face 1 is on the left, face 2 on the right.)

      (2) Sketches in any characteristics showing in the log end; measures and records their dimensions.

      (3) If the log end is clear, writes a large "C" in the end diagram.

      (4) Moves to the small end of the log and faces it, holding the clipboard with the open end against the chest. (Note that face 1 is now on the right, and face 2 is on the left, a mirror-image of the large end. This matches the small-end circle on the diagram form.)

      (5) Follows the same procedures as for the large end.

   e. Records information from caller:

      (1) Log length.

      (2) Long and short axes of large and small ends.

      (3) Bark thickness and sapwood thickness.

      (4) Spiral grain and other special characteristics.

   f. Checks for sweep and crook. If either is present, helps caller position log properly in order to make measurements; records the measurements provided by caller.

   g. If caller is not yet ready to call the surface characteristics, assists him to complete his tasks by measuring diameters, bark thickness, etc.

B. Surface characteristics.

1. Duties of caller.

a. Begins at the large end of the log.

b. Begins with the left side of the log, face 1.

c. Looks carefully for overgrowths, log knots, and other surface characteristics. Remembers to look under the measuring stick.

d. Uses hatchet to

(1) Remove dirt,

(2) Smooth off log knots for easier measuring, and to see if they are live or dead, but

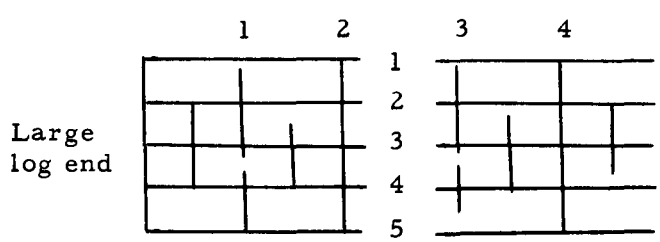
(3) Does not use hatchet to chop into log to decide what to call a specific surface characteristic.

e. When a characteristic is found,

(1) Determines:

(a) Its location; with measuring stick, measures distance from butt end of log to nearest inch;

(b) Its position on face, to nearest eighth of face width. Mentally divides face into five positions (see sketch below). (Position 1 is top edge of face; 3 is the face center; 5 is the bottom edge; 2 and 4 are the halfway points between 1 and 3, and between 3 and 5, respectively.) On larger logs, makes further breakdowns, as 1-1/2, 2, 2-1/2, etc.



(2) Measures its size with a steel tape according to the instructions for the characteristic.

(3) Locates center of small circular characteristics like log knots and bumps; locates edges of larger irregularly shaped characteristics like scars and cankers.

(4) Calls the characteristic to the recorder in this order:

(a) Distance from log end (e.g., at 10 feet, 4 inches),

(b) Position on face (e.g., position 4),

(c) What it is (e.g., live log knot),

(d) How big it is (e.g., 3 inches).

f. Marks each characteristic with keel as it is called out to recorder.

g. Completes entire length of face 1 in this manner.

h. Returns to large end of log, and repeats procedure on the right side, face 2, always giving the face number when starting on a new face.

i. When face 2 is completed, turns log over 180°.

(1) Uses the arrow marked on log end as the stopping place (point down).

(2) If possible to turn log without strain, uses peaveys; otherwise, uses mechanical equipment.

j. Repeats the above procedure for faces 3 and 4.

2. Duties of recorder.

a. Stands at point slightly behind caller, where it is possible to see face being diagramed.

b. Diagrams on the form all information called out by the caller.

(1) Positions each characteristic accurately on the form:

(a) Pinpoints the center of small circular blemishes and

(b) Locates edges; this is vital on large, irregular blemishes.

(2) Sketches the outline of each characteristic to scale. (Note: Lengthwise scale is fixed and does not vary with log diameter. Crosswise scale (across the log face) varies directly with log diameter; a 6-inch log knot covers twice as much of a face on a 12-inch-diameter log as it does on a 24-inch log (see sketch on page 6).)

(3) Uses appropriate symbols to identify each particular characteristic diagramed.

(4) Writes symbols and sizes so that

(a) It is clear which characteristic they refer to,

(b) They are neat and legible, and

(c) The eventual user of the diagram can read them without turning the form on end or upside down.

c. As time permits, assists the caller by looking for overgrowths, small log knots, and other hard-to-see characteristics on the log surface.

d. On the form, writes "Clear" on any face free of anything to diagram. This shows that the face has been examined and not merely overlooked.

e. Before leaving the log, checks form to assure that all required information is recorded.

f. Places completed form directly under the last form in the clipboard.

g. Moves to next log and repeats procedure. If the log was bucked from a long log at the diagraming area, the next log will be the adjacent log.

APPENDIX

SAMPLE FORM NO. 1

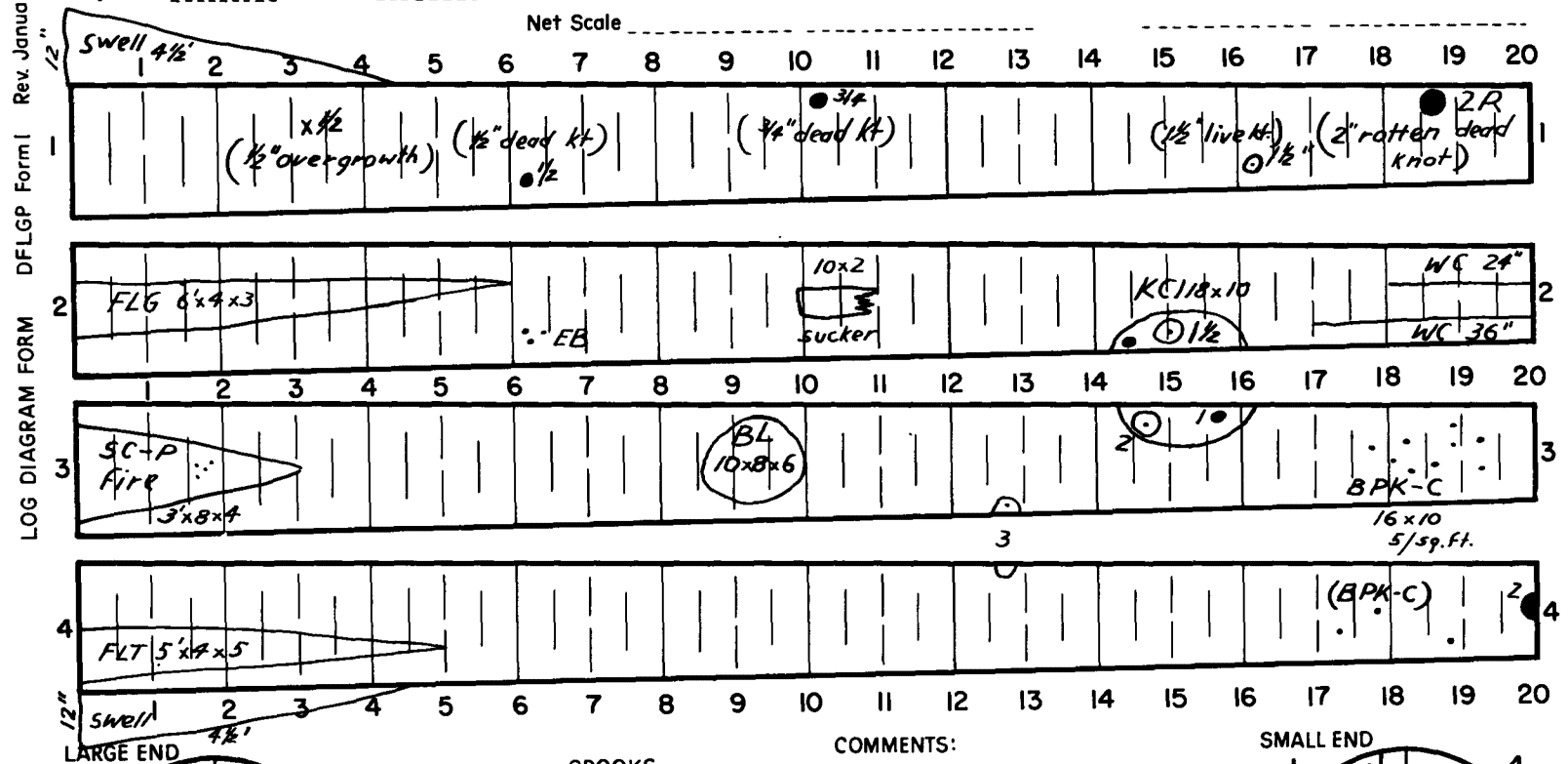
LOG DIAGRAM FORM DFLGP Form 1 Rev. January 1963

Mill 58 Area No. 3 Length 20' Scale Deductions: Mill Tally: Log Grade:

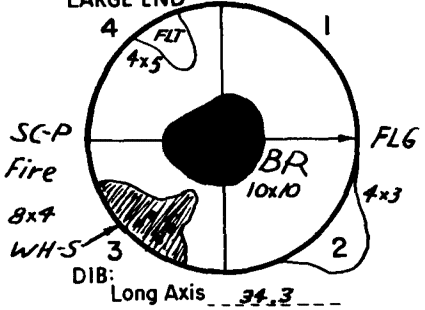
Species 01 Tree No. 64 Scaling Diam. Total Value

Project No. — Log No. 1 Gross Scale Log $/M

Net Scale

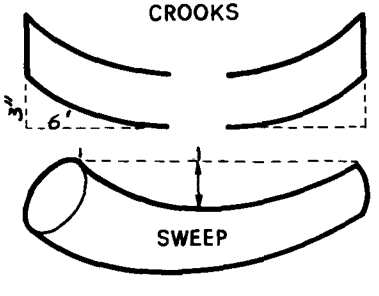


LARGE END



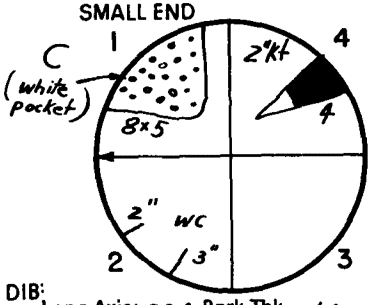
DIB: Long Axis 34.3 Short Axis 30.7

CROOKS



COMMENTS:

SMALL END



DIB: Long Axis: 20.4 Bark Thk. .61 Short Axis: 20.2 Sap Thk. .64

Diagrammer(s) MEP-DH Date 7/10/61

Surface Indication of Spiral Grain:
Amount_____ Point of Measurement_____

Ring Count_____
Rings Last Inch_____

LOG SURFACE CHARACTERISTIC SYMBOLS

	110	Bark Distortion (D)		111	Flange (FLG)			Scars and Seams:
		Bird Peck:		111	Flute (FLT)		111	Open (SC-O)
1/	110	Open (BPK-O)			Log Knots:		111	Partially Open (SC-P)
1/	110	Closed (BPK-C)	1/	D	Live (⊙)		110	Closed (SC-C)
1/	101	Bulge (Bulge)	1/	D	Dead (●)			Cause:
	112	Bump (B)	1/	D	Rotten (⊙ R or ● R)			Fire (Fire)
		Burl:	1/	D	Overgrowth (X)			Frost (Frost)
	111	Sound (BL)	1/	112	Cluster (KCl)			Lightning (Light)
	111	Unsound (UBL)		110	Sucker Limb (Sucker)			Rubbing or Felling (R-F)
	101	Butt Swell (Swell)	1/	110	Epicormic Branch (EB)			Other (By cause or unknown)
	111	Canker (Cank)		111	Mechanical Damage (MD)	1/	101	Sweep (SW)
	220	Conk (C)		111	Sap rot (SR)		111	Undercut (UC)
1/	101	Crook (CR)					100	Weather checks (WC) (If over 1 inch deep)

LOG END CHARACTERISTIC SYMBOLS

	120	Bark Pocket (BP)		111	Mechanical Damage (MD)		111	Scars and Seams (Use log surface code)
	110	Blue Stain (BS)		110	Pitch, massed (MP)			
		Checks:	1/	280	Pitch Pocket (PP)	1/	180	Shake (SH)
1/	110	Natural (CH)	1/	180	Pitch Ring (PR)		110	Spangle (SP)
	100	Weather (WC)		110	Pitch Seam (PS)		111	Stump Shot (SS)
	110	Compression Wood (CW)	1/	100	Pith Off Center (POC)		111	Undercut (UC)
1/	110	Crotch (Y)			Rot:			Worm Holes:
	220	Log Knots (Use log surface code)		110	Butt Rot (BR)		110	Pin (WH-P)
				110	Trunk Rot (TR)		110	Small (WH-S)
				010	Sap Rot (SR)		110	Large (WH-L)

1/ Special type of measurement. See diagraming instructions.

NOTE: The numbers indicate the dimension measurements to be recorded for the characteristic. The first digit refers to length, the second to width, and the third to height (or depth). The numeral "1" indicates the measurement is taken to the nearest inch; the numeral "2," to the nearest half inch; "0" indicates that no dimension measurement is required; "D" means that a diameter measurement is required. For example: The number "111" means measure length, width, and height (or depth), all to the nearest inch; "180" means measure length to the nearest inch, measure width of opening to eighth inch, and no height (or depth) measurement is required.

SAMPLE FORM NO.2

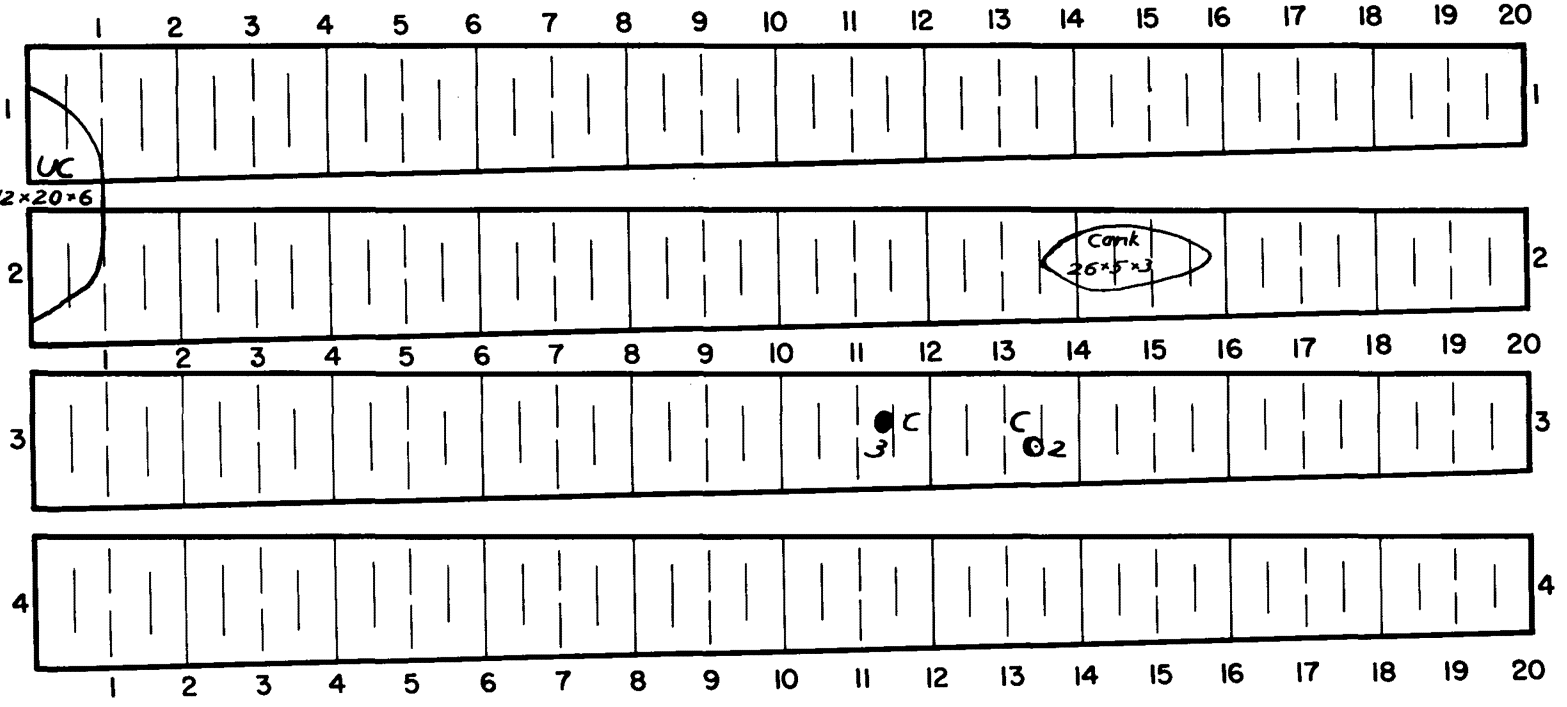
LOG DIAGRAM FORM DFLGP Form 1 Rev. January 1963

Mill 60 Area No. 6 Length 16 6 Scale Deductions: Mill Tally: Log Grade:

Species 11 Tree No. 136 Scaling Diam. Total Value

Project No. – Log No. 1 Gross Scale Log $/M

Net Scale



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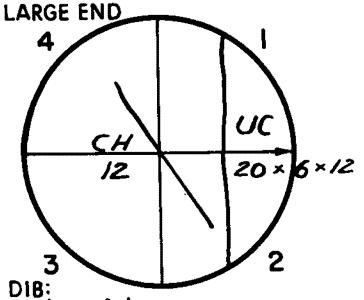
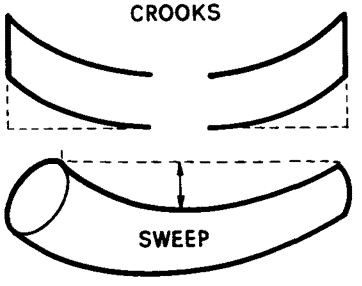


DIB:

Long Axis 23.2

Short Axis 22.8

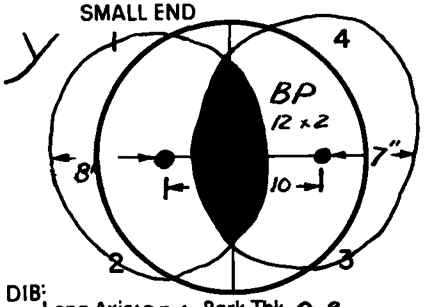
CROOKS



Diagrammer(s) WJ – JH Date 7/13/61

COMMENTS:

SMALL END



DIB:

Long Axis: 25.1 Bark Thk. 0.8

Short Axis: 16.4 Sap Thk. 1.1

Surface Indication of Spiral Grain:
Amount_____ Point of Measurement_____

Ring Count_____
Rings Last Inch_____

LOG SURFACE CHARACTERISTIC SYMBOLS

	110	Bark Distortion (D)		111	Flange (FLG)			Scars and Seams:
		Bird Peck:		111	Flute (FLT)		111	Open (SC-O)
1/	110	Open (BPK-O)			Log Knots:		111	Partially Open (SC-P)
1/	110	Closed (BPK-C)	1/	D	Live (⊙)		110	Closed (SC-C)
1/	101	Bulge (Bulge)	1/	D	Dead (●)			Cause:
	112	Bump (B)	1/	D	Rotten (⊙ R or ● R)			Fire (Fire)
		Burl:	1/	D	Overgrowth (X)			Frost (Frost)
	111	Sound (BL)	1/	112	Cluster (KCl)			Lightning (Light)
	111	Unsound (UBL)		110	Sucker Limb (Sucker)			Rubbing or Felling (R-F)
	101	Butt Swell (Swell)	1/	110	Epicormic Branch (EB)			Other (By cause or unknown)
	111	Canker (Cank)		111	Mechanical Damage (MD)	1/	101	Sweep (SW)
	220	Conk (C)		111	Sap rot (SR)		111	Undercut (UC)
1/	101	Crook (CR)					100	Weather checks (WC)
								(If over 1 inch deep)

LOG END CHARACTERISTIC SYMBOLS

	120	Bark Pocket (BP)		111	Mechanical Damage (MD)		111	Scars and Seams
	110	Blue Stain (BS)		110	Pitch, massed (MP)			(Use log surface code)
		Checks:	1/	280	Pitch Pocket (PP)	1/	180	Shake (SH)
1/	110	Natural (CH)	1/	180	Pitch Ring (PR)		110	Spangle (SP)
	100	Weather (WC)		110	Pitch Seam (PS)		111	Stump Shot (SS)
	110	Compression Wood (CW)	1/	100	Pith Off Center (POC)		111	Undercut (UC)
1/	110	Crotch (Y)			Rot:			Worm Holes:
	220	Log Knots		110	Butt Rot (BR)		110	Pin (WH-P)
		(Use log surface code)		110	Trunk Rot (TR)		110	Small (WH-S)
				010	Sap Rot (SR)		110	Large (WH-L)

1/ Special type of measurement. See diagraming instructions.

NOTE: The numbers indicate the dimension measurements to be recorded for the characteristic. The first digit refers to length, the second to width, and the third to height (or depth). The numeral "1" indicates the measurement is taken to the nearest inch; the numeral "2," to the nearest half inch; "0" indicates that no dimension measurement is required; "D" means that a diameter measurement is required. For example: The number "111" means measure length, width, and height (or depth), all to the nearest inch; "180" means measure length to the nearest inch, measure width of opening to eighth inch, and no height (or depth) measurement is required.

SAMPLE FORM NO. 3

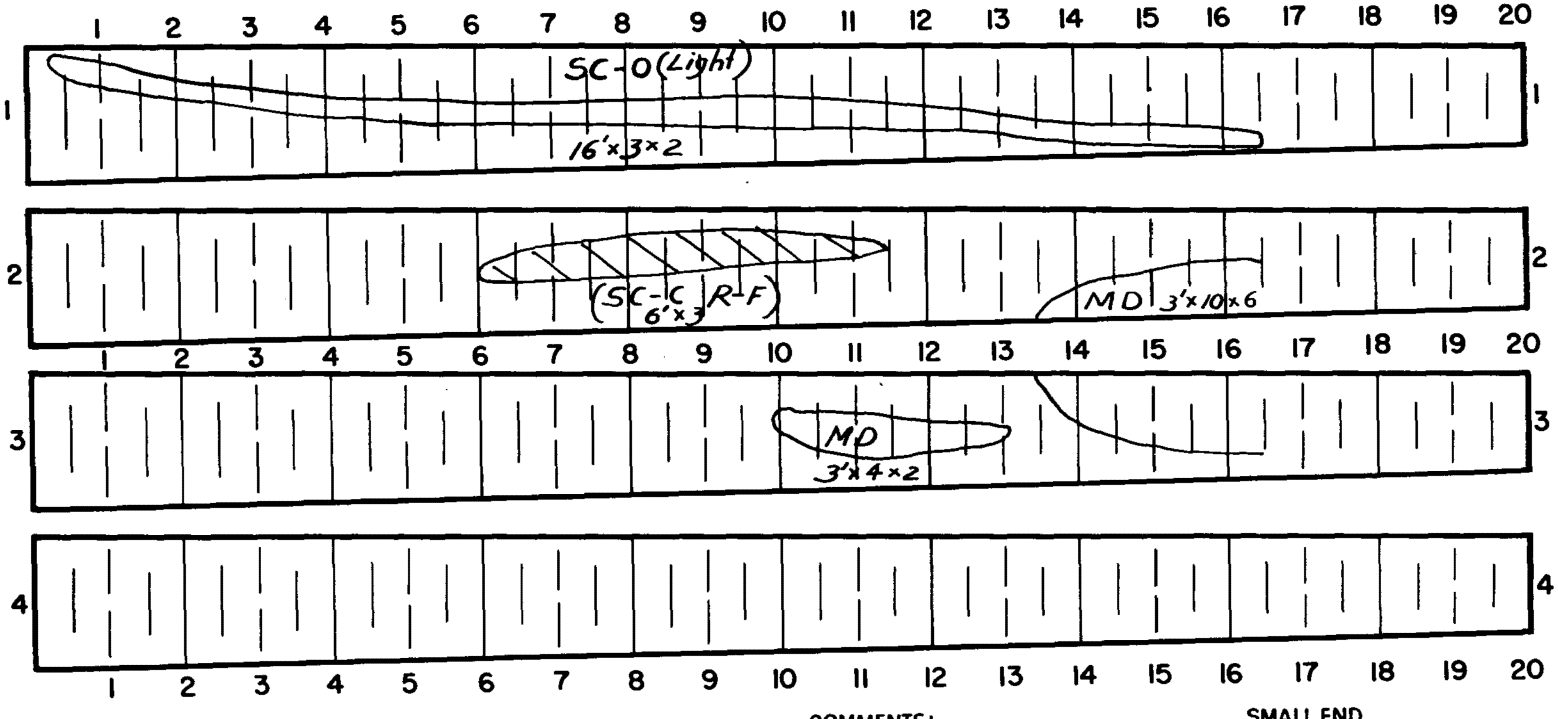
LOG DIAGRAM FORM DFLGP Form I Rev. January 1963

Mill 58 Area No. 6 Length 16 Scale Deductions: Mill Tally: Log Grade:

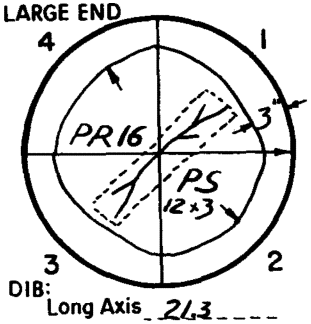
Species 01 Tree No. 138 Scaling Diam. Total Value

Project No. — Log No. 2 Gross Scale Log $/M

Net Scale

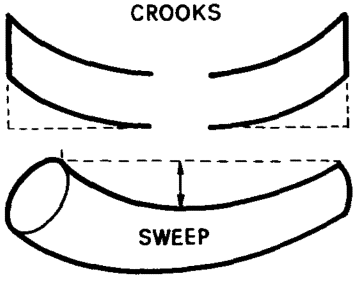


LARGE END



DIB:
Long Axis 21.3
Short Axis 20.9

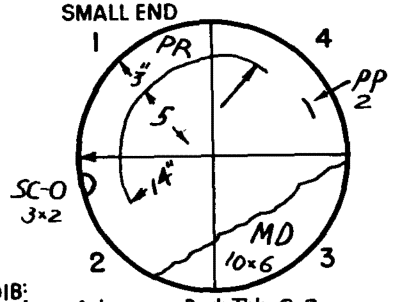
CROOKS



Diagrummer(s) GJ-JH Date 7/13/61

COMMENTS:

SMALL END



DIB:
Long Axis: 18.4 Bark Thk. 0.8
Short Axis: 18.2 Sap Thk. 0.9

Surface Indication of Spiral Grain:
Amount_____ Point of Measurement_____

Ring Count_____
Rings Last Inch_____

LOG SURFACE CHARACTERISTIC SYMBOLS

	110	Bark Distortion (D)
		Bird Peck:
1/	110	Open (BPK-O)
1/	110	Closed (BPK-C)
1/	101	Bulge (Bulge)
	112	Bump (B)
		Burl:
	111	Sound (BL)
	111	Unsound (UBL)
	101	Butt Swell (Swell)
	111	Canker (Cank)
	220	Conk (C)
1/	101	Crook (CR)
	111	Flange (FLG)
	111	Flute (FLT)
		Log Knots:
1/	D	Live (⊙)
1/	D	Dead (●)
1/	D	Rotten (⊙ R or ● R)
1/	D	Overgrowth (X)
1/	112	Cluster (KCl)
	110	Sucker Limb (Sucker)
1/	110	Epicormic Branch (EB)
	111	Mechanical Damage (MD)
	111	Sap rot (SR)
		Scars and Seams:
	111	Open (SC-O)
	111	Partially Open (SC-P)
	110	Closed (SC-C)
		Cause:
		Fire (Fire)
		Frost (Frost)
		Lightning (Light)
		Rubbing or Felling (R-F)
		Other (By cause or unknown)
1/	101	Sweep (SW)
	111	Undercut (UC)
	100	Weather checks (WC) (If over 1 inch deep)

LOG END CHARACTERISTIC SYMBOLS

	120	Bark Pocket (BP)
	110	Blue Stain (BS)
		Checks:
1/	110	Natural (CH)
	100	Weather (WC)
	110	Compression Wood (CW)
1/	110	Crotch (Y)
	220	Log Knots (Use log surface code)
	111	Mechanical Damage (MD)
	110	Pitch, massed (MP)
1/	280	Pitch Pocket (PP)
1/	180	Pitch Ring (PR)
	110	Pitch Seam (PS)
1/	100	Pith Off Center (POC)
		Rot:
	110	Butt Rot (BR)
	110	Trunk Rot (TR)
	010	Sap Rot (SR)
	111	Scars and Seams (Use log surface code)
1/	180	Shake (SH)
	110	Spangle (SP)
	111	Stump Shot (SS)
	111	Undercut (UC)
		Worm Holes:
	110	Pin (WH-P)
	110	Small (WH-S)
	110	Large (WH-L)

1/ Special type of measurement. See diagraming instructions.

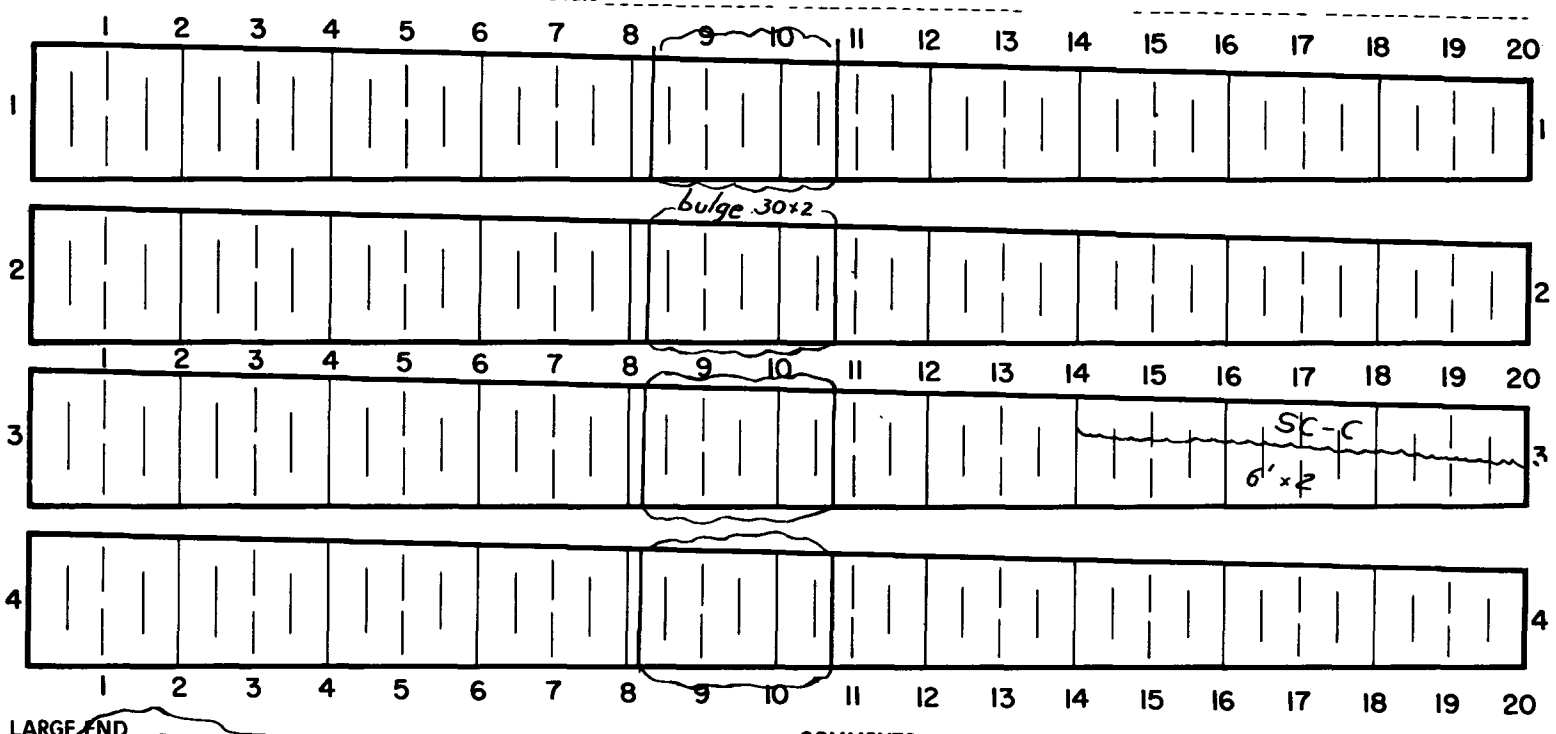
NOTE: The numbers indicate the dimension measurements to be recorded for the characteristic. The first digit refers to length, the second to width, and the third to height (or depth). The numeral "1" indicates the measurement is taken to the nearest inch; the numeral "2," to the nearest half inch; "0" indicates that no dimension measurement is required; "D" means that a diameter measurement is required. For example: The number "111" means measure length, width, and height (or depth), all to the nearest inch; "180" means measure length to the nearest inch, measure width of opening to eighth inch, and no height (or depth) measurement is required.

SAMPLE FORM NO. 4

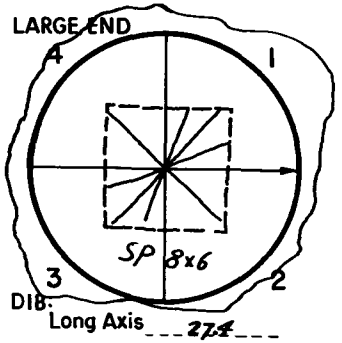
LOG DIAGRAM FORM DFLGP Form I Rev. January 1963

Mill 60 Area No. 5 Length 20$ Scale Deductions:
Species 11 Tree No. 113 Scaling Diam.
Project No. — Log No. 1 Gross Scale
Net Scale

Mill Tally: Log Grade:
Total Value
Log $/M

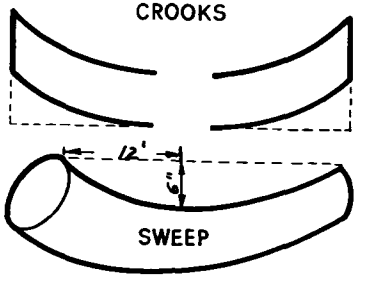


LARGE END



DIB:
Long Axis 27.4
Short Axis 25.1

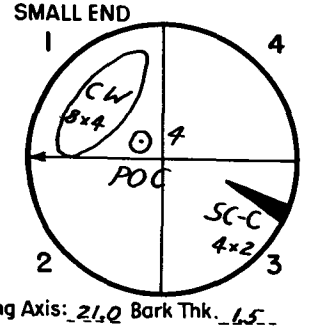
CROOKS



Diagrammer(s) PL - HW Date 7/12/61

COMMENTS:

SMALL END



DIB:
Long Axis: 21.0 Bark Thk. 1.5
Short Axis: 20.6 Sap Thk. 3.0

Surface Indication of Spiral Grain:
Amount_____ Point of Measurement_____

Ring Count_____
Rings Last Inch_____

LOG SURFACE CHARACTERISTIC SYMBOLS

	110	Bark Distortion (D)		111	Flange (FLG)			Scars and Seams:
		Bird Peck:		111	Flute (FLT)		111	Open (SC-O)
1/	110	Open (BPK-O)			Log Knots:		111	Partially Open (SC-P)
1/	110	Closed (BPK-C)	1/	D	Live (⊙)		110	Closed (SC-C)
1/	101	Bulge (Bulge)	1/	D	Dead (●)			Cause:
	112	Bump (B)	1/	D	Rotten (⊙ R or ● R)			Fire (Fire)
		Burl:	1/	D	Overgrowth (X)			Frost (Frost)
	111	Sound (BL)	1/	112	Cluster (KCl)			Lightning (Light)
	111	Unsound (UBL)		110	Sucker Limb (Sucker)			Rubbing or Felling (R-F)
	101	Butt Swell (Swell)	1/	110	Epicormic Branch (EB)			Other (By cause or unknown)
	111	Canker (Cank)		111	Mechanical Damage (MD)	1/	101	Sweep (SW)
	220	Conk (C)		111	Sap rot (SR)		111	Undercut (UC)
1/	101	Crook (CR)					100	Weather checks (WC) (If over 1 inch deep)

LOG END CHARACTERISTIC SYMBOLS

	120	Bark Pocket (BP)		111	Mechanical Damage (MD)		111	Scars and Seams (Use log surface code)
	110	Blue Stain (BS)		110	Pitch, massed (MP)			
		Checks:	1/	280	Pitch Pocket (PP)	1/	180	Shake (SH)
1/	110	Natural (CH)	1/	180	Pitch Ring (PR)		110	Spangle (SP)
	100	Weather (WC)		110	Pitch Seam (PS)		111	Stump Shot (SS)
	110	Compression Wood (CW)	1/	100	Pith Off Center (POC)		111	Undercut (UC)
1/	110	Crotch (Y)			Rot:			Worm Holes:
	220	Log Knots (Use log surface code)		110	Butt Rot (BR)		110	Pin (WH-P)
				110	Trunk Rot (TR)		110	Small (WH-S)
				010	Sap Rot (SR)		110	Large (WH-L)

1/ Special type of measurement. See diagraming instructions.

NOTE: The numbers indicate the dimension measurements to be recorded for the characteristic. The first digit refers to length, the second to width, and the third to height (or depth). The numeral "1" indicates the measurement is taken to the nearest inch; the numeral "2," to the nearest half inch; "0" indicates that no dimension measurement is required; "D" means that a diameter measurement is required. For example: The number "111" means measure length, width, and height (or depth), all to the nearest inch; "180" means measure length to the nearest inch, measure width of opening to eighth inch, and no height (or depth) measurement is required.

SAMPLE FORM NO.5

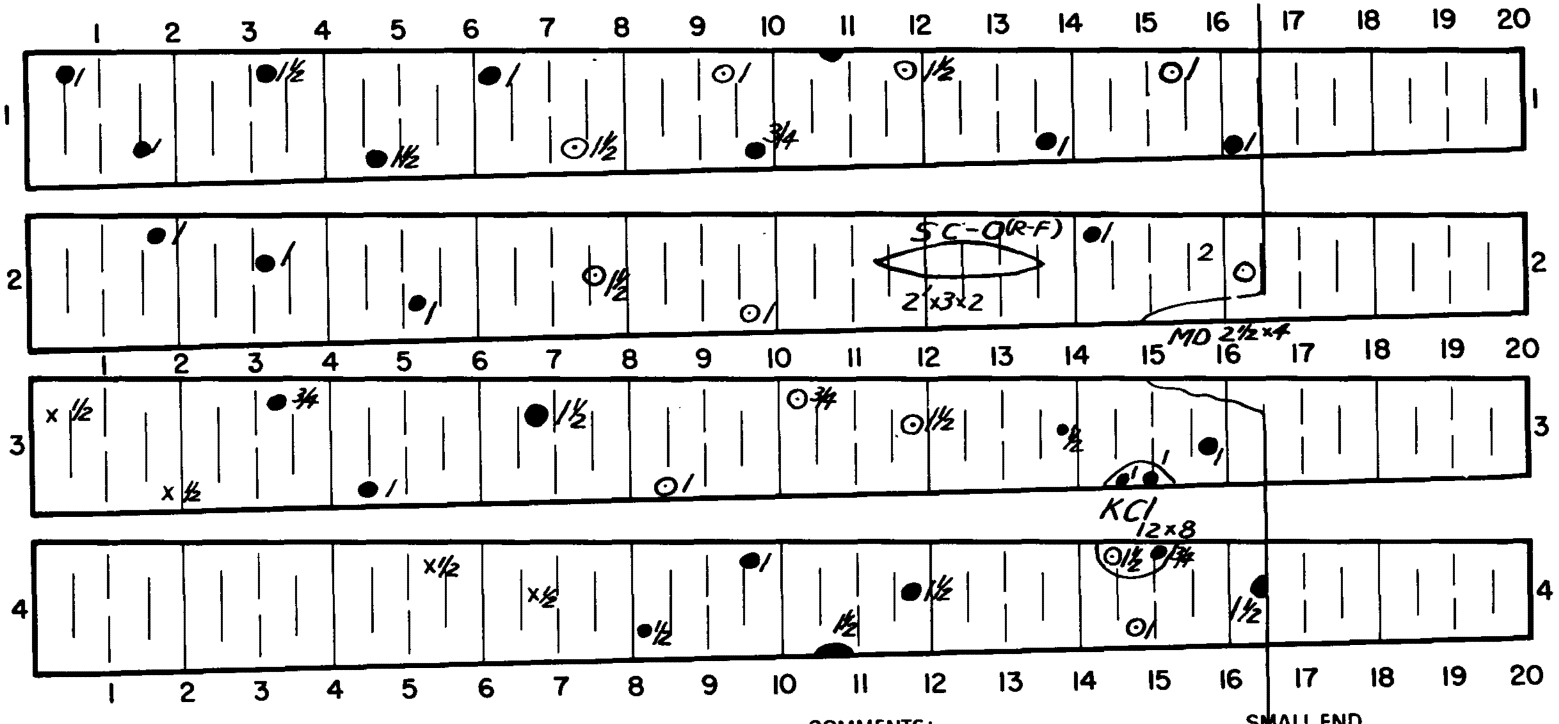
LOG DIAGRAM FORM DFLGP Form I Rev. January 1963

Mill 86 Area No. 5 Length 16.6 Scale Deductions: Mill Tally: Log Grade: 1

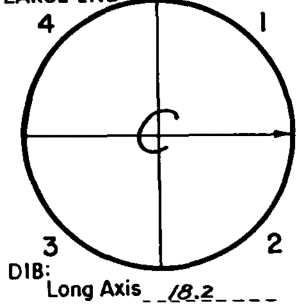
Species 52 Tree No. 159 Scaling Diam. Total Value

Project No. — Log No. 2 Gross Scale Log $/M

Net Scale

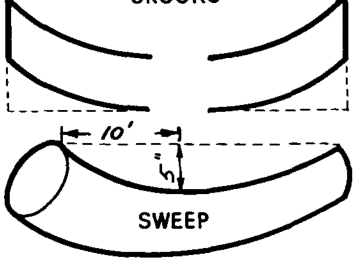


LARGE END



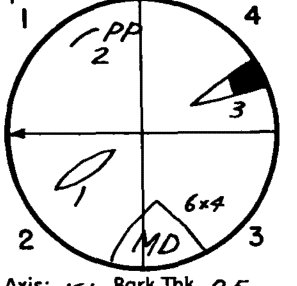
DIB: Long Axis 18.2 Short Axis 17.3

CROOKS



COMMENTS:

SMALL END



DIB: Long Axis: 16.1 Bark Thk. 0.5 Short Axis: 15.6 Sap Thk. 1.3

Diagrammer(s) NEW - OLD Date 7/10/61

Surface Indication of Spiral Grain:
Amount_____ Point of Measurement_____

Ring Count_____
Rings Last Inch_____

LOG SURFACE CHARACTERISTIC SYMBOLS

	110	Bark Distortion (D)
		Bird Peck:
1/	110	Open (BPK-O)
1/	110	Closed (BPK-C)
1/	101	Bulge (Bulge)
	112	Bump (B)
		Burl:
	111	Sound (BL)
	111	Unsound (UBL)
	101	Butt Swell (Swell)
	111	Canker (Cank)
	220	Conk (C)
1/	101	Crook (CR)
	111	Flange (FLG)
	111	Flute (FLT)
		Log Knots:
1/	D	Live (⊙)
1/	D	Dead (●)
1/	D	Rotten (⊙ R or ● R)
1/	D	Overgrowth (X)
1/	112	Cluster (KCl)
	110	Sucker Limb (Sucker)
1/	110	Epicormic Branch (EB)
	111	Mechanical Damage (MD)
	111	Sap rot (SR)
		Scars and Seams:
	111	Open (SC-O)
	111	Partially Open (SC-P)
	110	Closed (SC-C)
		Cause:
		Fire (Fire)
		Frost (Frost)
		Lightning (Light)
		Rubbing or Felling (R-F)
		Other (By cause or unknown)
1/	101	Sweep (SW)
	111	Undercut (UC)
	100	Weather checks (WC) (If over 1 inch deep)

LOG END CHARACTERISTIC SYMBOLS

	120	Bark Pocket (BP)
	110	Blue Stain (BS)
		Checks:
1/	110	Natural (CH)
	100	Weather (WC)
	110	Compression Wood (CW)
1/	110	Crotch (Y)
	220	Log Knots (Use log surface code)
	111	Mechanical Damage (MD)
	110	Pitch, massed (MP)
1/	280	Pitch Pocket (PP)
1/	180	Pitch Ring (PR)
	110	Pitch Seam (PS)
1/	100	Pith Off Center (POC)
		Rot:
	110	Butt Rot (BR)
	110	Trunk Rot (TR)
	010	Sap Rot (SR)
	111	Scars and Seams (Use log surface code)
1/	180	Shake (SH)
	110	Spangle (SP)
	111	Stump Shot (SS)
	111	Undercut (UC)
		Worm Holes:
	110	Pin (WH-P)
	110	Small (WH-S)
	110	Large (WH-L)

1/ Special type of measurement. See diagraming instructions.

NOTE: The numbers indicate the dimension measurements to be recorded for the characteristic. The first digit refers to length, the second to width, and the third to height (or depth). The numeral "1" indicates the measurement is taken to the nearest inch; the numeral "2," to the nearest half inch; "0" indicates that no dimension measurement is required; "D" means that a diameter measurement is required. For example: The number "111" means measure length, width, and height (or depth), all to the nearest inch; "180" means measure length to the nearest inch, measure width of opening to eighth inch, and no height (or depth) measurement is required.